REMARKS

Claims 1-37 are pending in this application. Claims 1-31 have been rejected.

Claims 1-31 have been amended for the sole reason of advancing prosecution. The amendments to claims 1 and 30 are supported, *inter alia*, by page 1, lines 15 to 20, and by figures 1A, 1B, 1C and page 8, lines 22-23. Claims 2-29 have been amended to recite claim terms in a manner consistent with the independent claims. Applicants, by amending any claims, make no admission as to the validity of any rejection made by the Examiner against any of these claims. Applicants reserve the right to reassert the original claim scope of any claim, in a continuing application. The subject matter of newly presented claims 32-37 is supported throughout the specification, claims and figures as originally filed, at least by original claims 1 and 8 and page 1, lines 15-21.

Support for the claims as amended appears throughout the specification, claims and figures as originally filed. Applicants respectfully submit that the amendments do not introduce any new matter within the meaning of 35 U.S.C. §132.

In view of the following, further and favorable consideration is respectfully requested.

I. At page 2 of the Official Action, claims 1-29 have been rejected under 35 USC § 112, second paragraph, as being indefinite.

The Examiner has rejected claims 1-29 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention, asserting that "Claim 1 recites the limitation of 'said arrangement being free of additional wings or tail arrangement'. However, elements

18, 19, and or 20 as shown in Figs. 1A-1D appear to be additional wings or tail arrangements. It is unclear what structure is being required and what structure is being excluded from the aircraft arrangement. Element 19, which is not claimed, can be considered to be additional 'tail arrangement'," and "Claims 2-29 are rejected for being dependent upon Claim 1."

Applicants note that elements 18 and 19 are side panels and rudder control surfaces, respectively, and elements 20 are control surfaces, of aft wing 14. Accordingly, the independent claims have been amended to recite "wherein said aft wing has side panels and control surfaces on at least one of said aft wing and said side panels" and thus reference the elements mentioned by the Examiner.

In view of the discussion above, Applicants respectfully submit that the pending claims present terminology which clearly sets forth the subject matter, and as such particularly points out and distinctly claims the subject matter. Accordingly, Applicants submit that the rejection of claims 1-29 under 35 U.S.C. §112 is overcome and respectfully request reconsideration and withdrawal of the rejection.

II. At pages 2-5 of the Official Action, claims 1-4, 6-22, 25 and 26 have been rejected under 35 USC § 103(a) as being unpatentable over U.S. Patent No. 2,147,968 to Delanne in view of U.S. Patent No. 6,626,398 to Cox et al.

The Examiner has rejected claims 1-4, 6-22, 25 and 26 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 2,147,968 to Delanne (hereinafter referred to as "Delanne") in view of U.S. Patent No. 6,626,398 to Cox et al. (hereinafter referred to as "Cox et al. 1").

Applicants respectfully traverse the rejection since all of the features of the presently claimed subject matter are not disclosed by the cited reference. To establish a *prima facie* case of obviousness, the Examiner must establish: (1) some suggestion or motivation to modify the references exists; (2) a reasonable expectation of success; and (3) the prior art references teach or suggest all of the claim limitations. *Amgen, Inc. v. Chugai Pharm. Co.*, 18 USPQ2d 1016, 1023 (Fed. Cir. 1991); *In re Fine,* 5 USPQ2d 1596, 1598 (Fed. Cir. 1988); *In re Wilson*, 165 USPQ 494, 496 (CCPA 1970).

A *prima facie* case of obviousness must also include a showing of the reasons why it would be obvious to modify the references to produce the present invention. *See Dystar Textilfarben GMBH v, C. H. Patrick*, 464 F.3d 1356 (Fed. Cir. 2006). The Examiner bears the initial burden to provide some convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings. *Id.* at 1366.

Overview

Applicants hereby fully reference and incorporate the Remarks of the Response filed January 26, 2009 and the Response filed September 29, 2009 (and supplemented October 26, 2009), in their entirety, where applicable.

As previously discussed, Mini and Micro UAV are special classes of aircraft; Mini-UAV are considered to include vehicles of about 20 cm to 1.2 m size, while Micro-UAV are limited to 6 inches (15 cm) in overall span and length according to the definition of the U.S. Defense Advanced Research Project Agency (DARPA). Conventional design specifications for Micro-UAV produce a set of conflicting requirements. Accordingly, the aerodynamic

design of such small aircraft as Mini and Micro UAV is not a matter of simply scaling down geometrically the design of larger aircraft.

This is mainly due to the low Reynolds number (for example in the order of about $2*10^4$ to about $3*10^5$) in horizontal flight and the requirement of low speed for such Mini and Micro UAV, which is comparable with moderate wing speeds of perhaps about 10 to about 20 m/s. In the case of the Mini and Micro UAV, their linear dimensions ***and the flight speeds*** are ***both*** considerably reduced with respect to larger conventional aircraft including conventional UAV, and thus the operating range of Reynolds number is *much less* than for the larger vehicles. It is also a well-known phenomenon that lift and drag characteristics deteriorate rapidly as Reynolds number is decreased, so that an acceptable performance in a particular aircraft design generally translates to unacceptable performance when the design is scaled down linearly and the design speed of the scaled design is also reduced to a fraction of the design speed of the original design.

Thus, Applicants respectfully submit that a person having ordinary skill in the art would recognize that configurations for aircraft, including UAV, larger than the aforesaid Mini and Micro UAV do not ordinarily apply thereto. Applicants further respectfully submit that the references cited do not explicitly disclose or suggest such Mini and Micro UAV, and therefore are not relevant prior art. This will be further elaborated below.

Rejection of claims 1-4, 6-22, 25 and 26

Independent claim 1 recites [a] *self-propelled Mini or Micro UAV configured for operating at Reynolds numbers in the range between about 20,000 and about 300,000, and comprising*

> a fore wing and an aft wing in tandem close-coupled arrangement, wherein said aft wing has side panels and control surfaces on at least one of said aft wing and said side panels, and tapered planform with positive sweep, said fore wing has non-positive trailing edge sweep, the fore wing and aft wing being disposed at different heights, and said arrangement being free of additional wings or tail arrangement.

Emphases added.

These features are not described nor rendered obvious by Delanne or Cox et al. 1, whether alone or in combination. Claims 2-29 (and newly presented claims 35 and 36) depend directly or indirectly from claim 1.

Applicants note that the Examiner comments in the "Response to Arguments" on page 7, item 19 of the Official Action that the previously submitted "discussion is not *commensurate with the scope of the claims since specific sizes, Reynolds numbers, and airspeeds are not being claimed.*" Applicants respectfully submit that claim 1 now recites the feature that the "*self-propelled Mini or Micro UAV* [is] *configured for operating at Reynolds numbers in the range between about 20,000 and about 300,000*" (while new claim 37 recites a *specific* airspeed, that the claimed mini- or micro- UAV is "*configured for operating at least at flight speeds in the range between about 10m/s to about 20 m/s*"). Thus, Applicants respectfully submit that the Examiner *de facto* concurs that the discussion/arguments previously submitted are commensurate with the scope of amended claim 1 as well as with the scope of newly presented claim 37.

Delanne "has for its subject an airplane or hydroplane presenting in comparison with known aircraft a considerable improvement in the qualities of minimum gliding ratio and buoyancy and enabling a more advantageous utilization of the fuselage, a more extended

visibility and greater security." *See* Delanne page 1, left col., lines 1-7.

Cox et al. 1 "provides an unmanned airborne reconnaissance vehicle having a fuselage, a forward wing pair and a rearward wing pair vertically separated by a gap and staggered fore and aft therebetween such that a general biplane configuration is formed. The present invention provides a pair of wing tip plates for joining the wing tips of the forward and rearward wings. The unmanned airborne reconnaissance vehicle of the present invention includes a power plant to propel the vehicle through the air and a generally T-shaped tail having a vertical stabilizer including a rudder and a full span elevator." *See* Cox et al. Abstract.

1. Lack of motivation to combine

Firstly, Applicants respectfully submit that Delanne was filed in 1935, many decades before the concept of Mini and Micro UAV were discussed and defined. Further, Delanne relates to a *full scale* aircraft and thus a person having ordinary skill in the art would not be motivated to consider the configurations disclosed there when wishing to improve on Mini and Micro UAV. In fact, the Examiner has agreed on page 3 of the Office Action that Delanne refers only to large manned aircraft, and has applied Cox et al. in an attempt to cure this deficiency of Delanne. Specifically, the Examiner admits that Delanne "does not disclose the aircraft arrangement as being a micro or mini UAV," and asserts that Cox et al. "teaches an arrangement which comprises a tandem close-coupled arrangement and is a mini or micro UAV (See Table 1)."

The Examiner has further asserted that "it would have been obvious... to down size and make autonomous the aircraft arrangement of Delanne in view of the teachings of Cox

et al. The motivation for doing so would have been to create an aircraft which can be handled in the battlefield (sizing of Cox et al.) yet has high load carrying capabilities and maneuverability (arrangement of Delanne)." Applicants respectfully submit that, notwithstanding the Examiner's stated position, there is no motivation whatsoever to combine Delanne and Cox et al. 1, and that a person having ordinary skill in the art would not combine Delanne and Cox et al. 1.

As has been previously submitted, the aerodynamic design of such small aircraft as Mini and Micro UAV's as currently claimed in claims 1 and 37 is not a matter of simply scaling down geometrically the design of larger aircraft. This is mainly due to the low Reynolds number in the order of about $2*10^4$ to about $3*10^5$ (claim 1) in horizontal flight and the requirement of low speed of about 10 to about 20 m/s (claim 37).

Thus, for example, if a wing that is designed for large aircraft for a particular Reynolds number is scaled down to 0.25 of its original linear dimensions, the flow velocity over the scaled down wing has to be ***increased*** by a factor of 4 (= 1/0.25) to obtain similar flow behavior (and similar Reynolds number) as in the original non-scaled wing, so that if the speed is maintained constant, there is inevitably a reduction in Reynolds number for the scaled wing. At the same time, scaling down the linear dimensions by a factor of 4 results in a reduction in wing area of 16 and a reduction in volume (and thus weight) of 64, which leads to lower wing loading and reduction of flight airspeed, and the reduction in airspeed further reduces the Reynolds number of the scaled wing relative to the original wing. Airspeed cannot be increased for the scaled wing as this will require flight at much lower lift coefficients relative to the unscaled wing, resulting in significant degradation of aerodynamic efficiency.

Thus, scaling down wing dimensions and reducing the flow velocity results in much lower Reynolds numbers, and thus flow conditions, with respect to the original wing.

In the case of claims 1 and 37, the claimed mini- and micro-UAV is configured for operating at Reynolds numbers and for operating at flight speeds, respectively, that are considerably reduced with respect to larger conventional aircraft as well as conventional UAV.

It is also a well-known phenomenon that lift and drag characteristics deteriorate rapidly as Reynolds number is decreased, so that an acceptable performance in a particular aircraft design generally translates to unacceptable performance when the design is scaled down linearly, and the design Reynolds number or the design speed of the scaled design is also reduced to a fraction of the design Reynolds number or design speed of the original design.

Thus, by definition, attempting to operate a specific full-scale aircraft geometry, that has been designed for one set of full-scale Reynolds number range and flight speed range, at a much lower Reynolds number range and flight speed range, will be expected by a person having ordinary skill in the art to result in a severe deterioration of performance, even when the geometry of the full-scale aircraft is reduced pro-rata.

Thus, Applicants respectfully submit that a person having ordinary skill in the art would recognize that air vehicle configurations for full scale aircraft, including UAV's, (larger than the aforesaid Mini and Micro UAV's) and which implicitly are configured to operate at much higher Reynolds numbers and/or flight speeds than claimed in claims 1 and 37 do not apply thereto and cannot be simply "scaled down."

The presently claimed subject matter addresses the long felt and unmet need of

providing a solution to a set of conflicting requirements for mini- and micro-UAV's. These conflicting requirements include, for micro-UAV's, on the one hand maximizing the allowable rectangular area of 15cm by 15cm, while providing acceptable stability and flying performance on the other hand. Conventional prior art designs for micro-UAV's, for example, provide low wing loading and increased Reynolds numbers, but on the other hand this results in wing shapes with low aspect ratio, reduced lift carrying capabilities and poor aerodynamic efficiency. Further, the control surfaces of conventional configurations have short moment arms and produce marginal stability and control characteristics, resulting in unsatisfactory flying qualities.

2. *There can be no motivation to combine: the asserted combination would render the cited reference(s) unsatisfactory for its intended purpose.*

Furthermore, Applicants respectfully submit that if the Delanne aircraft were to be "scaled down" to sizes comparable to Cox et al. 1, the resulting miniaturized aircraft, by definition, would no longer provide a configuration in which "*the whole of the fuselage is rendered habitable from the front to the rear end*", as the aircraft would now be rendered too small for human habitation and "unmanned", as in Cox et al. 1, in contrast with the intended purpose of Delanne page 1, left column, lines 22-25. However, it is an accepted principle that if a proposed modification would render the prior art invention being modified (by the secondary reference) unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir.1984).

Applicants respectfully submit that assuming *arguendo* the Delanne aircraft were to

be downsized even further to a size commensurate with the claimed operating Reynolds number range in claim 1 or the claimed flight speed range in claim 37, the further miniaturized aircraft would suffer severe performance penalties, as has already been discussed above regarding the effect of operating at low Reynolds numbers and low flight speeds, and would be rendered *unsuitable* for its implicit purpose of providing adequate flight performance. This, again, is contrary to the principle expressed by *In re Gordon* discussed above.

3. Delanne and Cox et al. 1 teach away from the claimed subject matter

With respect to the rejection of claim 1, the Examiner relies on Cox et al. 1 to downsize the arrangement of Delanne. However, Applicants respectfully submit that the operating Reynolds numbers implied by Cox et al. 1 are far in excess of the operating Reynolds number range 20,000 to 300,000 recited in claim 1, or the operating flight speed range 10m/s to about 20m/s of claim 37. For example, Cox et al. 1 implies an operating Reynolds number range of between 350,000 to 1,000,000, which is *qualitatively* and *quantitatively* different from the range recited in claim 1. Thus, Cox et al. 1 itself ***teaches away*** from a UAV configured for operating in the Reynolds number range of claim 1 and cannot support a *prima facie* case of obviousness.

4. Improper Hindsight; the Examiner has not identified the finite number of predictable, known options from the numerous combinational prior art possibilities

Applicants also respectfully note that of all the features and elements disclosed in Cox et al. 1, *only the size and unmanned nature of the aircraft* were chosen by the

Examiner to be combined to replace the size and manned nature of the aircraft disclosed by Delanne. It is respectfully submitted that the asserted motivation benefits directly from improper hindsight in view of the claimed subject matter.

Applicants further respectfully submit that, as already discussed above, the presently claimed subject matter provides specific combinations of aircraft structural parameters for a mini- or micro UAV configured for operating at low Reynolds number range or low flight speed range, which are well beyond the domain of full-sized aircraft and larger UAV's.

A person having ordinary skill in the art recognizes that when wishing to configure a new aircraft such as a mini- or micro-UAV, there are a very large number of prior art parameters from which to choose to provide the aircraft configuration. To name but a few such parameters by way of example: having empennage or being tailless; having canard or no canard; single wing or multiple wings; wing parameters including aspect ratio, span, chord, wing sections; close-coupled fore and aft wings; uncoupled wings; wings having side panels, or no panels; wing booms or no wing booms; wings having tapered, non-tapered, elliptical or other platforms; wings having positive sweep, negative sweep or zero sweep for the leading edge of each wing; wings having positive sweep, negative sweep or zero sweep for the trailing edge of each wing; wings being at same height or at different heights in the fuselage; wing dihedral or anhedral; delta wings; blended body wing configurations; flying wing configurations, lifting body configurations; optimized for subsonic, transonic, supersonic cruise; etc.

However, the prior art cited by the Examiner totally fails to identify *which* parameters are critical for such a *mini- or micro-UAV as claimed*, or which parameters are likely to be

successful for *such a mini- or micro-UAV as claimed*. Applicants respectfully submit that under such circumstances as above, in view of *In re Kubin* (CAFC 2009), the claimed combinations are not obvious under U.S.C. 103.

5. Not all elements taught or shown

Lastly, Applicants respectfully submit that combining Delanne with Cox et al. 1 still will not result in a mini or micro-UAV configured for operating in the claimed Reynolds number range *or* the claimed flight speed range, as Cox et al. 1 does not provide the claimed operating ranges and thus cannot cure Delanne's deficiency.

Applicants respectfully submit that neither Delanne nor Cox et al., whether taken alone or in combination teach, suggest or describe "[a] *self-propelled Mini or Micro UAV configured for operating at Reynolds numbers in the range between about 20,000 and about 300,000*, and comprising a fore wing and an aft wing in tandem close-coupled arrangement, wherein said aft wing has side panels and control surfaces on at least one of said aft wing and said side panels, and tapered planform with positive sweep, said fore wing has non-positive trailing edge sweep, the fore wing and aft wing being disposed at different heights, and said arrangement being free of additional wings or tail arrangement," (emphases added) as recited in claim 1.

Cox et al. 1 has been applied by the Examiner to cure the acknowledged deficiency of Delanne, as much as Delanne "does not disclose the aircraft arrangement as being a micro or mini UAV." However, Cox et al. 1 does not cure this deficiency and in fact also does not disclose a "micro or mini UAV."

As already discussed above, Mini and Micro UAV are special classes of aircraft, and

Mini-UAV are considered to include vehicles of about 20 cm to 1.2 m size, while Micro-UAV are limited to 6 inches (15 cm) in overall span and length according to the definition of DARPA. In contrast, the size of the UAV described by Cox et al. 1 is much larger than the size defined by DARPA, and thus does not enable the Cox et al. 1 UAV to be classified as a Mini-UAV, much less a Micro-UAV. For example, referring to Examiner cited Table 1 of Cox et al. 1 and to Cox et al. 1 col. 4, lines 33-35, Cox et al. 1 describes a wing span of about 2.13 meters (84 inches) and a fuselage length of about 2 meters (80 inches); these values show that the Cox et al. 1 UAV is at least almost twice the linear dimension *upper limit* of Mini-UAV and therefore much, much larger than Micro-UAV.

Further, with respect to the asserted combination, Applicants respectfully submit that "down siz[ing]' the Cox et al. 1 UAV aircraft is also not a simple matter. For example, and as outlined above in item 1, if the UAV wings of Cox et al. 1 (which a person having ordinary skill in the art would consider as having been designed for a particular Reynolds number) are scaled down from its original linear dimensions to enable the Cox et al. 1 UAV to be classified as a *Mini*-UAV, the flow velocity over the corresponding scaled-down wing has to be ***increased*** by a corresponding factor to obtain similar flow behavior (and a similar Reynolds number) relative to the original non-scaled wing. If the flow velocity is to be maintained (constant), there is inevitably a reduction in the Reynolds number for the scaled-down wing. Scaling down the linear dimensions also results in a reduction in wing area and a reduction in volume and weight, which in turn lead to lower wing loading and reduction of flight airspeed; the reduction in airspeed further reduces the Reynolds number of the scaled-down wing relative to the original (non-scaled) wing. Accordingly, airspeed cannot be increased for the scaled-down wing. Notably, as discussed in item 1, these

adverse effects are contrary to the aims and expectations of Cox et al. 1. A person having ordinary skill in the art would expect then, that the effect of scaling the Cox et al. 1 UAV down further to *Micro*-UAV dimensions is even more drastic. Accordingly, Applicants respectfully submit that neither Delanne nor Cox et al. 1 teach, show or suggest "[a] self-propelled Mini or Micro UAV configured for operating at Reynolds numbers in the range between about 20,000 and about 300,00" as presently claimed.

6. Additional considerations

Applicants respectfully submit that starting with Delanne and merely scaling down the size thereof would be expected to provide a miniaturized aircraft having the identical geometry as the full-scale aircraft, but with severely degraded performance, and thus would be ultimately unsuitable as an operating aircraft. In contrast, the presently claimed subject matter provides a mini- or micro-UAV having significant performance (*see* for example page 6, line 22 to page 7, line 18 of the specification), and thus represents an unexpected result as compared with the cited prior art.

Further, one or more of the elements in the air vehicle of claim 1 and of claim 37 are being used in a non-established way. In these claims, these one or more elements are used in a mini- or micro-UAV, while in the cited prior art, such elements are only known in use with full-scale aircraft, which as already discussed above are ***qualitatively*** different from the mini- or micro-UAV claimed, being configured for operating at completely different Reynolds number and air speed ranges.

Thus, Applicants respectfully submit that claim 1 is novel, unobvious and

consequently patentable over the cited references. For at least these reasons, all claims dependent from claim 1, including dependent claims 2-4, 6-22, 25 and 26 are also novel, unobvious and consequently patentable over the cited prior art by virtue of their direct or indirect dependency from claim 1. No *prima facie* rejection under 35 U.S.C. 103(a) can be made against these claims and Applicants request an indication of such.

Notwithstanding the above, Applicants respectfully submit that the dependent claims also have features which are novel, unobvious and patentable *per se*. For example, claim 7 recites that "*said fore wing and said aft wing partially overlap each other in plan view*". In contrast to claim 7, Delanne does not disclose any overlap between the front and rear wings in plan view.

Claim 8 (and similarly claim 32) recites that the "tandem arrangement of said fore wing and said aft wing has an overall width W and an overall length L including any control surfaces of said UAV, and the sum of planform wing areas of said tandem arrangement is at least 70% of the product W x L".

If a rectangle is drawn over the plan view of Delanne Fig. 2, so that a first pair of opposed sides of the rectangle are aligned with the leading edge of the fore wing and the aft edge of the aft wing of Delanne, and a second pair of opposed sides of the rectangle are in abutment with the wing tips of the fore wing, the rectangle represents the product "WxL" of claim 8 (and claim 32). However, in contrast to the presently claimed subject matter, the sum of the wing areas of the front and rear wings of Delanne is much less than 70% of the area of this rectangle.

Similarly, if a rectangle is drawn over the plan view of Libellula, so that a first pair of opposed sides of the rectangle are aligned with the leading edge of the fore wing and the

trailing edge at the wing tip of the aft wing of Libellula, and a second pair of opposed sides of the rectangle are in abutment with the wing tips of the aft wing, the rectangle represents the product "WxL" of claim 8 (and claim 32). However, in contrast to the presently claimed subject matter, the sum of the wing areas of the front and rear wings of Libellua is much less than 70% of the area of this rectangle.

In view of the foregoing, reconsideration and withdrawal of the above rejection is respectfully requested.

III. At page 5 of the Official Action, claims 5, 23, 24 and 27-29 have been rejected under 35 USC § 103(a) as being unpatentable over U.S. Patent No. 2,147,968 to Delanne and U.S. Patent No. 6,626,398 to Cox et al. as applied to claims 1 and 4 above, and further in view of U.S. Patent No. 3,954,231 to Fraser.

The Examiner has rejected claims 5, 23, 24 and 27-29 under 35 U.S.C. §103(a) as being unpatentable over Delanne in view of Cox et al. 1 as applied to claims 1 and 4 above, and further in view of U.S. Patent No. 3,954,231 to Fraser (hereinafter referred to as "Fraser").

A brief outline of the relevant authority is set forth above in Section II. Applicants respectfully submit that, with respect to the pending claims, a proper case of *prima facie* obviousness has not been established because, whether taken alone or together, none of the cited references teach or suggest all the limitations of the claims as required by *In re Wilson*. In view of the following, Applicants respectfully traverse this rejection.

Claims 5, 23, 24 and 27-29 depend directly or indirectly from claim 1, discussed above. Independent claim 1 recites [a] *self-propelled Mini or Micro UAV configured for operating at Reynolds numbers in the range between about 20,000 and about 300,000*,

and comprising

> a fore wing and an aft wing in tandem close-coupled arrangement, wherein said aft wing has side panels and *control surfaces on at least one of said aft wing and said side panels*, and tapered planform with positive sweep, said fore wing has non-positive trailing edge sweep, the fore wing and aft wing being disposed at different heights, and said arrangement being free of additional wings or tail arrangement.

Emphases added.

Applicants refer to the discussion in Section II regarding amended independent claim 1 and patentable features therein not described by Delanne and Cox et al. 1. Applicants respectfully submit that claims 5, 23, 24 and 27-29 are novel, unobvious and consequently patentable over Delanne and Cox et al. 1, whether taken separately or in combination, *inter alia*, at least due to their dependency from patentable claim 1 reciting"[a] *self-propelled Mini or Micro UAV configured for operating at Reynolds numbers in the range between about 20,000 and about 300,000*," (emphases added) for the reasons discussed in detail above with reference to claim 1, which discussions are incorporated herein in their entirety.

Fraser "relates to the arrangement of lifting, stabilizing, and flight controlling, wing surfaces, placed near the front of an aircraft, with main lifting wing surfaces, placed toward the rear. Control surfaces placed rearwardly on the aft fuselage and/or the rear main lifting wing surfaces, are also indicated." *See* Fraser Abstract.

However, Fraser also does not remedy the deficiencies of Delanne and Cox et al. 1. Fraser also fails to teach or suggest, *inter alia*, "[a] *self-propelled Mini or Micro UAV configured for operating at Reynolds numbers in the range between about 20,000 and about 300,000*," (emphases added) as recited in the present claims. Applicants respectfully note

that the Examiner has applied Fraser "to provide the aircraft arrangement of Delanne and Cox et al. 1 as described above with the pylon, wing twist, and stability characteristics of Fraser" and not to address the deficient size or control of the asserted combined UAV.

In view of the foregoing, Applicants respectfully submit that nothing in the cited art references (Delanne, Cox et al. 1 or Fraser) renders the presently claimed subject matter obvious within the meaning of 35 U.S.C. §103(a). Therefore, Applicants respectfully submit that claim 1 is non-obvious, novel and patentable over the cited references. Similarly, claims 2-29, 35 and 36 (including claims 5, 23, 24 and 27-29) are non-obvious, novel and patentable at least due to their dependency from claim 1, as well as for additional features recited therein. Accordingly, the Examiner is respectfully requested to withdraw these rejections.

IV. At pages 5-6 of the Official Action, claims 30 and 31 have been rejected under 35 U.S.C. § 102(b) as anticipated by the Miles Aircraft Libellula M.35 (designed in 1942) or, in the alternative, under 35 U.S.C. § 103(a) as obvious over the Miles Aircraft Libellula M.35 in view of U.S. Patent Application Publication No. 2003/0155463 to Cox et al.

The Examiner has rejected claims 30 and 31 under 35 U.S.C. § 102(b) as anticipated by the Miles Aircraft Libellula M.35 (designed in 1942, hereinafter referred to as "Libellula") or, in the alternative, under 35 U.S.C. § 103(a) as obvious over Libellula in view of U.S. Patent Application Publication No. 2003/0155463 to Cox et al. (hereinafter referred to as "Cox et al. 2").

Rejection under 35 U.S.C. § 102(b)

For a reference to anticipate an invention, all of the elements of that invention must

be present in the reference. The test for anticipation under section 102 is whether each and every element as set forth in the claim is found, either expressly or inherently, in a single prior art reference. *Verdegaal Bros. v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987); MPEP §2131.

Claim 30 recites "[a] *self-propelled Mini or Micro UAV configured for operating at Reynolds numbers in the range between about 20,000 and about 300,000 and comprising*

> *a fore wing and an aft wing in tandem close-coupled arrangement*, wherein said aft wing has side panels and control surfaces *on at least one of said aft wing and said side panels*, and tapered planform with positive sweep, said fore wing has non-positive trailing edge sweep, the fore wing and aft wing being disposed at different heights, and said arrangement being free of additional wings or tail arrangement, and *wherein a planform area of the aft wing is not less than a planform area of the fore wing.*

Emphases added.

Firstly, Applicants respectfully submit that Libellula does not disclose or suggest any "close-coupled arrangement" between the front ("fore") wings and the rear ("aft") wings. In contrast to the claimed subject matter, the wings of Libellula are separated by a spacing that is significantly larger than the forward wing root chord at the fuselage, and this spacing increases rapidly towards the wing tips. This is in direct contrast to the "close-coupled arrangement" of claim 30 (*see* also for example page 9, lines 1-6 of the specification).

Furthermore, Libellula refers to a **full size** manned fighter aircraft, configured for operating at Reynolds numbers well in excess of the range claimed in claim 30. Accordingly, Libellula fails to disclose, teach or suggest each and every feature of the claims, at least "[a] self-propelled Mini or Micro UAV configured for operating at Reynolds numbers in the range between about 20,000 and about 300,000 and comprising a fore wing and an aft wing in tandem close-coupled arrangement..." and Applicants respectfully

submit that Libellula cannot anticipate nor render obvious claim 30.

Rejection under 35 U.S.C. § 103(a)

A brief outline of the relevant authority with respect to 35 U.S.C. § 103(a) is set forth above in Section II. Applicants respectfully submit that, with respect to the pending claims, a proper case of *prima facie* obviousness has not been established because, whether taken alone or together, none of the cited references teach or suggest all the limitations of the claims as required by *In re Wilson*. In view of the following, Applicants respectfully traverse this rejection.

Cox et al. 2 describes "[a]n unmanned airborne reconnaissance system, the unmanned airborne reconnaissance system including a lightweight, portable, powered aircraft and a foldable launch rail, the aircraft, in a broken down condition and the launch rail in a broken down condition fitable inside a box, the box capable of being carried by one man. The launch system includes an elongated launch rail with the carriage assembly, and a propulsion means for accelerating the carriage assembly from one end of the launch rail to the other. The carriage assembly releasably engages the aircraft so as to propel the aircraft from one end of the launch rail to the other. The propulsion may be by a cartridge that explodes and releases a gas through a cylinder, or by elastic cords. The aircraft is guided through the air either by a programmed onboard computer which controls the control surfaces of the aircraft and/or by remote control. The aircraft typically contains a camera for recording and transmitting images received from the ground below." *See* Cox et al. 2 Abstract.

Applicants respectfully submit that the arguments provided above regarding Delanne

and claim 1 can be applied, *mutatis mutandis*, to Libellula and claim 30. Furthermore, the arguments provided above regarding the combination of Delanne and Cox et al. 1 apply, *mutatis mutandis*, to the combination of Libellula and Cox et al. 2.

Thus, Applicants respectfully submit that claim 30 is novel, unobvious and consequently patentable over the cited references. For at least the reasons discussed above with respect to claim 30, dependent claim 31 (and dependent claims 32-34) is also novel, unobvious and consequently patentable over the cited prior art by virtue of its direct dependency from claim 30. Notwithstanding the above, Applicants respectfully submit that the dependent claims also have features which are novel, unobvious and patentable *per se*.

V. New claims 32-37

Applicants further respectfully submit that with respect to the cited prior art of record, for at least the reasons discussed above, *mutatis mutandis*, newly presented claims 32-37 are also novel, unobvious and consequently patentable over the cited references, at least due to dependency from claims or features recited therein which have been discussed above. Applicants respectfully submit that claims 32-37 have further features which are also *per se* novel and inventive over the cited art.

Claim 37 recites "[a] *self-propelled Mini or Micro UAV configured for operating at least at flight speeds in the range between about 10m/s to about 20 m/s*, and *comprising*

> a fore wing and an aft wing in tandem close-coupled arrangement, wherein said aft wing has side panels and control surfaces *on at least one of said aft wing and said side panels*, and tapered planform with positive sweep,

> said fore wing has non-positive trailing edge sweep, the fore wing and aft wing being disposed at different heights, and said arrangement being free of additional wings or tail arrangement.

Emphases added.

The arguments discussed above in Section II with respect to claim 1 and 8 are applicable, *mutatis mutandis*, to claims 37 and 32, respectively. For example, Cox et al. 1 also specifies a speed range between about 25m/s and about 49m/s (55mph loiter speed and 110mph maximum dash speed – see column 4, lines 53-57), far above the range claimed in claim 37, and in fact cannot operate at less than 22.3m/s (50mph), which is the stall speed. Thus, Cox et al. 1 itself ***teaches away*** from a UAV configured for operating in the Reynolds number range of claim 1 or the operating speed range of claim 37, and cannot support a *prima facie* case of anticipation or obviousness against the claimed subject matter.

Similarly, the specific dimensions for the mini-UAV and micro-UAV recited in claims 33 to 36 are neither disclosed nor rendered obvious by the prior art of record.

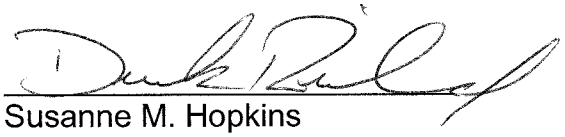
CONCLUSION

Applicants assert that the claims are in condition for immediate allowance and early notice to that effect is earnestly solicited. Should the Examiner deem that any further action by Applicants' undersigned representative is desirable and/or necessary, the Examiner is invited to telephone the undersigned at the number set forth below.

In the event this paper is not timely filed, Applicants hereby petition for an appropriate extension of time. Please charge any fee deficiency or credit any overpayment to Deposit Account No. 14-0112.

Respectfully submitted,

THE NATH LAW GROUP



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